# EMERGENCY INCIDENT REHABILITATION PROGRAM FOR THE LUBBOCK FIRE DEPARTMENT

EXECUTIVE DEVELOPMENT

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## ABSTRACT

The problem identified for this applied research project was that the Lubbock Fire Department had no Emergency Incident Rehabilitation Program. It was the purpose of this project to develop an Emergency Incident Rehabilitation Program for the Lubbock Fire Department.

Action research was the method used to answer the following questions: Why is there a need for an Emergency Incident Rehabilitation Program? What protocols are used when firefighters enter the Rehabilitation Sector? What resources are needed to establish a Rehabilitation Sector? What procedures have adjacent departments implemented for Emergency Incident Rehabilitation Programs?

Procedures that were used to complete this research included a literature review of fire service journals, telephone interviews with area fire departments and a semi-structured interview with the American Red Cross and Lubbock County Emergency Medical Services.

The results of this research showed the need for fire departments to establish Emergency Incident Rehabilitation Programs and the positive impact they can have on firefighter health and safety.

Recommendations included incorporating an Emergency Incident Rehabilitation Program into department procedures, training of personnel in the purpose of the program, and that every fire department implement a program if one is not in place. It was also recommended that further research be conducted to compare the death and injury rates of firefighters at incidents where rehab was in place to those incidents where rehab was not implemented.

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## INTRODUCTION

Firefighting is a very physically demanding occupation. Firefighters may work prolonged periods of time in bulky protective clothing, wearing self contained breathing apparatus (SCBA), dragging hoselines, operating power equipment and raising ladders. These operations at an emergency scene can result in fatigue among firefighters, which can lead to increased chances of injury. Chris Eckert (1996) states, “The days of the blood and guts, made of iron firefighter are over. The firefighters of today are no less the warriors than their predecessors. We cannot afford, however, to literally work our people to death” (p. 9). Fire departments across the nation have started to recognize this correlation between firefighter fatigue and injury, and have implemented Emergency Incident Rehabilitation Programs to address this issue. The problem is the Lubbock Fire Department (LFD) has no Emergency Incident Rehabilitation Program.

The purpose of this applied research project is to develop an Emergency Incident Rehabilitation Program for the LFD. Action research was the method used to answer the following questions so that an Emergency Incident Rehabilitation Program could be developed:

1. Why is there a need for an Emergency Incident Rehabilitation Program?
2. What protocols are used when firefighters enter the Rehabilitation Sector?
3. What resources are needed to establish a Rehabilitation Sector?
4. What procedures have adjacent departments implemented for Emergency Incident Rehabilitation Programs?

## BACKGROUND AND SIGNIFICANCE

Operations on the fireground require firefighters to wear heavy protective equipment while performing physically demanding tasks in extreme conditions. This is often stressful and physically exhausting for firefighters. A study conducted by the University of Illinois Fire Service Institute measured the psychological and physiological responses of firefighters to firefighting tasks during controlled live fires. Two tasks consisting of advancing a 1 ¾ - inch hoseline for eight minutes and a chopping task for eight minutes were conducted. Average heart rates for the firefighters participating in the study were 170 beats per minute after completion of the first task and 183 beats per minute after the second task. These results show that firefighters reach near maximal heart rates when performing firefighting tasks (Clark, Smith, Petruzzello & Bone, 1998).

*Comprehensive Wellness for Firefighters* (1993) relates the workload that firefighters face to oxygen consumption. A job classified as easy, such as sweeping stairwells, requires 20 units of oxygen per minute. A hard job, such as digging ditches, requires 35 units of oxygen per minute. Firefighting and rescue work are classified as physically demanding requiring at least 45 units of oxygen every minute.

Despite these physical demands, firefighters are often reluctant to take a break until the emergency is brought under control, working themselves to near exhaustion in the process. This can result in decreased safety on the fireground. According to Gordon Sachs (1994) when firefighters become fatigued, their ability to react and make critical decisions is impaired. To address the issue of firefighter fatigue at an emergency scene, fire departments are implementing Emergency Incident Rehabilitation Programs.

Chris Eckert (1996) defines rehab as, “The systematic removal of personnel from an incident scene for the purpose of providing rest, replacement of body fluids, and assessment of the overall physical and mental condition of the individual at the emergency scene” (p. 8). Eckert (1996) discusses an incident which involved him being sent to rehab. At rehab he felt tired, which he reported was normal to him after the physical exertion spent at an incident. EMS personnel took his pulse as part of medical monitoring and found it to be rapid and irregular. He was transported to the hospital for further evaluation and was diagnosed with atrial fibrillation. He was treated for this problem and has been released to duty. This incident demonstrates the impact an Emergency Incident Rehabilitation Program can have on an organization by intervening in medical problems before they become life threatening.

The LFD is located in the Texas panhandle and protects a population of 200,000 in an area covering 130 square miles with 236 personnel located at 13 fire stations. The department responds to approximately 5,000 incidents per year and provides fire, heavy rescue, water rescue, hazardous material, and automobile extrication services to its citizens. Temperatures in the summer can exceed 100°F, and in the winter, wind chill temperatures below 0°F are possible. These temperature extremes can lead to heat exhaustion or frost bite at the emergency scene.

The LFD does not have an Emergency Incident Rehabilitation Program. Rehabilitation of firefighters is mentioned briefly in the LFD Incident Command Procedures; “In severe or major working incidents, such as major fires, an area will be designated by the Operations Officer for R&R” (LFD Procedures manual, 1997). This has led to a haphazard approach at best in implementing a rehab area. Currently when

a rehab area is set up, it consists of Red Cross arriving on the scene to distribute fluids and food. No officer is assigned to be in charge of the rehab area, and no medical monitoring of personnel takes place. Emergency Medical Service (EMS) is notified only if a injury occurs. Personnel are allowed to go to the rehab area as they feel is necessary, resulting in decreased accountability at the incident. An Emergency Incident Rehabilitation Program would address these issues and allow for improved firefighter safety and accountability.

The National Fire Academy (NFA) *Executive Development* course was instrumental in the research and development of this Emergency Incident Rehabilitation Program. Unit one's "Working as a Team" with topics such as consensus, feed back, teamwork and ground rules for working as a team are very important when developing a procedure that involves the participation of several different agencies. Unit three's "Research" module was used to meet the requirements of this applied research project.

## LITERATURE REVIEW

A literature review was conducted to determine the need for an Emergency Incident Rehabilitation Program, along with the components and resources necessary to setup a Rehabilitation Sector. The literature was divided into four areas; need for emergency incident rehabilitation, protocols used when firefighters enter the Rehab Sector, resources needed to establish a Rehab Sector and procedures adjacent departments have implemented.

### Need for emergency incident rehabilitation

The literature showed that many times on the fireground the focus has tended to be on the latest apparatus, improved protective clothing, advances in nozzle design,

and performance as the most important resources in bringing the emergency under control. Even though more attention has been paid to occupational health and safety in recent years, the focus has been more on resources firefighters use, rather than firefighters as a resource (Brooks, Parsons-Nicota & Richardson, 1998). This type of thinking is starting to shift in that firefighters are being thought of as the most valuable resource at the incident. Robert Laford (1996) expressed these thoughts in that, "Many times we think that, with the apparatus on hand, the incident can be controlled. We sometimes don't recognize, however, that apparatus does not extinguish fires—manpower does" (p. 15).

To address the issue of firefighters as a resource, NFPA 1500: *Standards on Fire Department Occupational Safety and Health* (1997 ed.) has addressed the need for Emergency Incident Rehabilitation Programs by stating that:

> The fire department shall develop standard operating procedures that outline a systematic approach for the rehabilitation of members operating at incidents. Provisions addressed in these procedures shall include medical evaluation and treatment, food and fluid replenishment, crew rotation, and relief from extreme climatic conditions (n.p.).

In addition, NFPA 1561: *Standard on Fire Department Incident Management System* (1995 ed.) requires that:

> The incident commander shall consider circumstances of each incident and make suitable provisions for the rest and rehabilitation of personnel operating at the scene. These provisions shall include medical evaluation and treatment,

> food and fluid replenishment, and relief from extreme climatic conditions, according to the circumstances of the incident (n.p.).

The Occupational Safety and Health Administration (OSHA) also requires that those workers, who work in a high heat and humidity environment must be provided with enough rest to recover from its effects (Collins, 1994).

Statistics show that almost half of fireground deaths are due to heart attacks, and that fireground stress is taking the largest toll on firefighters (Brooks, 1998). According to Hal Burnett (1998), NFPA statistics show that 95% of these heart attacks are a result of physiological and metabolic stress. In addition to these deaths, the International Association of Firefighters *1996 Death and Injury Survey* (n.d.) documents 35,150 line of duty injuries. Over 68% of these injuries occur at the scene of an emergency incident with sprains, strains, lacerations and contusions making up the bulk of these injuries.

Although all these deaths and injuries cannot be tied directly to a lack of an Emergency Incident Rehabilitation Program, Theodore Jarboe (1994) states, “Activities that require heavy physical exertion for a sustained period can result in excessive fatigue, increased stress and diminished alertness. When this happens, the affected firefighters have a greater risk of being injured” (p. 40). William Sullivan (1996) further adds:

> The reason we get away with ignoring rehab is easy to figure. Many firefighters have been killed by heart attacks and many have fallen from roofs, but the cause rarely is linked to failure to take rehab. We know from experience, however, that overexertion is intrinsically associated with cardiac arrest. And we know, too, that we make more mistakes when we’re exhausted (p. 52).

With the hostile environments that firefighters face, it is necessary for firefighters to wear protective gear to prevent injury. This protective gear will provide protection from the heat of the fire, but it also restricts the ability of the body to cool itself by restricting the airflow around it. This leads to increased sweating and loss of body fluids by the firefighter, without much heat loss. Firefighters can lose from two to four liters of fluid per hour in firefighting activities. These losses are not only due to sweating but also by breathing compressed air in the SCBA. When air is compressed, the moisture is removed from the air, and as firefighters breathe this bottled air they put some of that lost water back into the air as they exhale. This loss of water further reduces the body's ability to dissipate heat. This results in increased viscosity of the blood and makes it harder to pump which adds stress on the cardiovascular system (O'Conner, 1996).

Dehydration can lead to a decreased ability to work on the fireground. *American College of Sports Medicine* (ACSM*) Guidelines for Exercise Testing and Prescription* states a two percent reduction in body weight due to dehydration can result in impaired temperature regulation and a four percent decrease results in a six percent decrease in maximal aerobic capacity (Muhler, Froelicher, Miller & York, 1995).

The literature reviewed suggests one of the reasons that rehabilitation is not implemented is a fear of reducing manpower at the incident while firefighters are in rehab. William Sullivan (1996) counters this argument by stating that:

> . . . a well-managed rehab program will provide fresh crews for reassignment on a rotating basis. A non existent or ill-managed system, however, is likely to result in crews' being exhausted to the point that they are not fit for reassignment (p. 55).

Other authors in the literature review share the view that the purpose of a rehabilitation program is not to reduce manpower, but to prevent injury (Collins, 1994).

To help fire departments implement an Emergency Incident Rehabilitation Program the Federal Emergency Management Agency (FEMA) and the United States Fire Administration (USFA) have published a sample Emergency Incident Rehabilitation Program. This program outlines responsibilities of the Incident Commander, supervisors, and personnel. It provides guidelines, identifies the components of a rehabilitation area, and provides a sample Emergency Incident Rehabilitation Form.

**Protocols used when firefighters enter the rehab sector**

The literature review revealed three major issues in determining the protocols to use when firefighters enter rehab. These issues include; when firefighters should be sent to rehab, how firefighters should be cared for while in rehab, and when firefighters should be allowed to leave rehab.

When determining the amount of time a firefighter works before being required to establish a rehab area, Kurt Ullman (1994) recommends that, “As a rule, most departments require rotation of crews out of fire after every two air bottles, roughly 45 minutes” (p. 35). The time element is an important consideration in determining when to establish a rehab area as not all emergency incidents require the use of SCBA, but still may require the establishment of a rehab area to send firefighters. Although the “Two air bottle rule” or 45 minutes is a good rule of thumb, they may have to be modified due to environmental factors.

How firefighters should be cared for while in rehab involves maintenance of normal body temperatures by either warming or cooling, medical monitoring, food and

fluid replacement, and rest according to Chris Eckert (1996). It was the consensus of the literature that rehab as a minimum includes EMS at the basic life support (BLS) level, but preferably at the advance life support (ALS) level.

The FEMA/USFA publication *Emergency Incident Rehabilitation* (1992) recommends that when a heat stress index is above 90°F or a wind-chill index below 10°F exists, that a rehab area be established. This is important so that firefighters can be allowed to keep their body temperatures as normal as possible. In cold weather, heat stress is still a danger for firefighters, and it is necessary to have shelter where firefighters can take off their protective clothing to maintain their body temperature. In hot weather, a cool or shaded area is necessary so firefighters can cool down.

Medical monitoring of firefighters needs to take place as they enter the rehab area. FEMA/USFA publication on *Emergency Incident Rehabilitation* (1992) recommends pulse rates be taken for a minimum of 30 seconds as early as possible in the rest period. If a firefighter's heart rate exceeds 110 beats per minute, an oral temperature should be taken. W. M. Collins (1994) refers to a Dayton Fire Department study that shows the best predictor of work capability was pulse rates. A pulse rate of 160 or higher indicated no work capability left; pulse rates between 140 to 160 showed limited capability, and less than 140 indicated the ability to return to work.

When in the rehab area one of the most important issues that face firefighters according to Joseph Bonanno (1996) is hydration. The consensus of the literature is that water is the best choice for hydration. The key to keeping the body cool is its ability to perspire, and water must be available to continue this effort. James Peterson (1998) suggests that firefighters, "Drink fluids that are relatively cool (40° to 50°F). Because

such fluids leave your stomach faster, you'll cool down faster" (p. 48). Coffee and soft drinks should be avoided as the caffeine can cause palpitations of the heart, and coffee is a diuretic which aids in dehydration (Bonanno, 1996). Firefighters should be required to hydrate when they enter the rehab area and should not rely on thirst as an indicator. Thirst is a late sign of dehydration, and if firefighters wait until they are thirsty to drink, it may be too late (Peterson, 1998).

At extended incidents of three hours or more, the department should provide food, such as stews, broths, or soups rather than fast food products since they are digested faster. Fruits, such as apples, oranges, and bananas also provide energy replacement (Sachs, 1994).

The literature review revealed some inconsistencies in how long firefighters should be allowed to rest in the rehab area before being released. The minimum time ranged from 10 minutes (Sachs, 1994) up to 30 minutes (Ullman, 1994), however, most recommended as a minimum, that a firefighter should not be released from rehab unless their heart rate was below 110 beats per minute. In addition, firefighters should not be allowed to leave rehab until the Rehab Sector Officer clears them.

## Resources needed to establish a Rehab Sector

The literature suggests that a Rehab Sector can be set up with a limited amount of resources or expense. EMS is a vital resource necessary in the Rehab Sector. Gordon Sachs (1994) says that EMS crews are usually dispatched as part of most fire responses, but they are usually limited to standby duty in the event of injury. Sachs suggests this is a waste of resources and EMS personnel should be used for medical monitoring of personnel in the rehab area. FEMA/USFA (1992) *Emergency Incident*

*Rehabilitation* recommends that medical service be performed as a minimum at the BLS level and preferably at the ALS level.

The rehab area should also have equipment and supplies such as fluids, medical equipment, fans, tarps, flood lights, heaters, blankets, towels, chairs, fire line tape and traffic cones. In addition food should be provided for long term incidents.

**Procedures adjacent departments have implemented**

Eleven fire departments were contacted in an informal telephone survey, and only four had an Emergency Incident Rehabilitation Standard Operating Procedure (SOP). In reviewing these SOP's, it was found these four departments followed the FEMA/USFA *Emergency Incident Rehabilitation* publication as a template in designing their own program by following a majority of their recommendations.

The Amarillo Fire Departments SOP (1997) follows FEMA/USFA recommendations with some additions. Amarillo specifies that an engine company may be assigned rehab responsibilities and also establishes a rehab cycle. The cycle starts once the low air alarm on the interior crews' air packs activate. Once this happens, the interior crew exits the structure and requests assignment to rehab. Personnel that were assigned to rapid intervention crew (RIC) duties then are assigned to Interior Sector duties. Crews that are staged at rehab are then assigned RIC duties. Medical monitoring of personnel is only conducted at hazardous materials incidents where rehab is implemented.

Garland Fire Department Operation SOP's (1997) address the issue of nourishment by identifying outside resources, such as the Salvation Army and Red Cross for use in providing food at an incident.

Dallas Fire Department Emergency Procedures (1995) establishes rehab at all second or greater alarm fires. In high rise incidents, the rehab area is located on the second floor below the fire. It designates specific personnel on the fire department to the positions assigned at rehab.

Denton Fire Department Rehabilitation SOP's (1995) designate two different levels of rehabilitation. Level I rehab is for short duration incidents, and crews are not rotated during the incident. Level II rehab is used in lengthy incidents, and a Rehab Officer is assigned to document personnel entering and exiting the rehab area. EMS personnel at the ALS level are provided in Level II rehab. Denton has incorporated vital sign guidelines into their SOP's to determine if personnel need to be transported to the hospital for further evaluation. These guidelines include systolic and diastolic blood pressures and pulse rates. Denton varied from FEMA/USFA guidelines in one area involving environmental conditions that indicate a need to establish a Rehabilitation Sector. Denton uses a heat stress index above 95°F or a wind-chill index below 20°F.

The other seven departments contacted did not have rehab SOP's but used some form of rehab at an emergency incident. These departments did not have any guidelines to determine when it was necessary to establish a rehab area or the procedures to follow once rehab was established. Food and fluids were provided when a rehab area was set up, but medical monitoring of personnel was not provided unless firefighters complained of symptoms or injury.

In summary, the literature discussed the physical exertion that firefighters endure at emergency incidents and its effect on their body. A review of this literature shows that an Emergency Incident Rehabilitation Program is very important for fire

departments to implement. This program can have a significant impact on firefighter health and safety at an emergency incident. Interviews conducted with other departments and agencies made it apparent that development of a program could be attainable by any fire department, even those with limited resources.

## PROCEDURES

Action research was the method used in developing an Emergency Incident Rehabilitation SOP for the LFD. The research procedures used in preparing this paper began with a literature review at the Learning Resource Center (LRC) at the NFA in August of 1998. Additional literature reviews were conducted from August through October 1998 at the Mahon Library and the LFD Training Academy's library located in Lubbock, Texas. On September 3, 1998, the Lubbock Professional Firefighter Association, Local 972 in Lubbock, Texas provided information from the International Association of Firefighters on *1996 Death and Injury Statistics.*

The literature targeted magazines, journals, newsletters and prior Executive Fire Officer (EFO) applied research projects for the rationale on establishing rehabilitation areas at emergency incidents. Applicable standards, such as NFPA and OSHA regulations, were also researched to understand their requirements or recommendations.

Telephone interviews were conducted with 11 fire departments located in Texas. These departments are within a 350-mile radius of Lubbock. This radius was selected due to similarities in the weather conditions experienced by these communities. Telephone interviews were utilized due to the distance separating the departments contacted. Personnel from these departments were contacted on the following dates:

August 25, 1998 Training Chief Monte Mansel, Midland Fire Department; Lieutenant David Oujesky, Arlington Fire Department; Lieutenant Anthony Peck, Dallas Fire Department; Captain J.D. Schulgen, Garland Fire Department; Training Officer Don Burris, Plainview Fire Department. August 27, 1998 Driver Chris Powel, San Angelo Fire Department; Assistant Fire Chief Dale Childress, Odessa Fire Department; Section Chief Training Division Alan Stork, Plano Fire Department. September 1, 1998 Division Chief Ken Dozier, Abilene Fire Department; Training Chief Mike Sessions, Denton Fire Department. September 4, 1998 District Chief Mike Guaze, Amarillo Fire Department.

The purpose of the telephone interview was to ask the following questions: Has the department implemented emergency incident rehabilitation at incidents? What are the criteria used to determine when rehab is implemented? What are the medical monitoring requirements of personnel in rehab? What other agencies are utilized when rehab is implemented? Do the departments have Emergency Incident Rehabilitation Programs in place?

Those departments with SOP's were asked to fax them to the LFD Training Academy. Four of the departments contacted had Emergency Incident Rehabilitation SOP's in place, and these are discussed in the Literature Review section and the Results section.

A non-structured interview was conducted with Israel Zúñiga, South Plains Regional Chapter of the American Red Cross, on September 15, 1998. The purpose of the interview was to determine what on-scene assistance could be provided when the LFD established a rehab area.

A non-structured interview was conducted with Debbie Morris, Lubbock County Hospital District EMS, on November 13, 1998. The purpose of the interview was to determine if resources were available to assign an EMS unit manned by ALS personnel to a fire department rehab area, and if the proposed LFD protocols for medical monitoring were in compliance with EMS protocols. The results these non-structured interviews are included in the Results section of this report.

## Limitations

Eleven fire departments in a limited geographical area were contacted in telephone interviews to determine how they addressed emergency incident rehabilitation. All the departments were staffed by paid firefighters. No volunteer fire departments were contacted as it was difficult to contact someone for information in the limited time allowed to complete and submit this applied research project. Due to this limited telephone survey, the information gathered from these departments should not be considered representative of the fire service.

Another limitation was the limited access to literature that pertained to emergency incident rehabilitation. The majority of the information contained in this report was obtained from the LRC at the NFA, and the LFD Training Academy Library. Very little literature was found at other libraries on the topic of emergency incident rehabilitation. The few books found, dealt with rehabilitation issues during physical fitness exercise.

## Definition of Terms

Atrial Fibrillation. Extremely rapid, incomplete contractions of the atria resulting in fine, rapid, irregular and uncoordinated movements.

Diastolic blood pressure. A measurement of the pressure exerted against the walls of the arteries while the left ventricle is at rest.

Diuretic. Tending to increase the flow of urine.

Palpation. Examination by touch.

Systolic blood pressure. A measurement of the pressure exerted against the walls of the arteries during contraction of the heart.

## RESULTS

### Why is there a need for an Emergency Incident Rehabilitation Program?

A review of the literature demonstrates the need for an Emergency Incident Rehabilitation Program. Chris Eckert (1996) states that, "Rehab should be a structured element of any incident of consequence" (p. 8). Vince Dunn (1995) suggests that in an effort to reduce firefighter injuries due to heat stress, more fire departments are creating rehab units. The need for an Emergency Incident Rehabilitation Program is addressed by NFPA 1500 (1997 ed.) and NFPA 1561 (1995 ed) which requires the Incident Commander to consider the circumstances of each incident and make suitable provisions for the rest and rehabilitation needs of firefighters operating at the emergency scene.

Studies have shown that firefighting is a very physically intensive occupation in which firefighters will achieve near maximal heart rates in a very short period of time. The number of firefighter injuries and deaths is well documented, however, whether any of these deaths and injuries can be tied to a lack of emergency incident rehabilitation is not. An example of the impact an Emergency Incident Rehabilitation Program can have on reducing injuries was discussed by Jerry Heilman (1998) and involved the

Nacogdoches Fire Department. Nacogdoches, in response to a high number of heat related injuries, implemented an Emergency Incident Rehabilitation Program and as a result, has experienced fewer on scene injuries. The consensus of the literature is that a well-managed rehabilitation program will allow for an adequate pool of fresh firefighters to assign to fireground sectors. W. Collins (1994) states:

> This sector serves to prevent injury and not to reduce manpower. Early and frequent visits to the rehab sector will reduce the probability of firefighter injury. In fact, a system where firefighters are rotated through a rehab sector will increase their endurance (p. 7).

Gordon Sachs (1994) further adds, "A successful rehabilitation program will improve the moral of the department and increase the level of productivity" (p. 30).

**What protocols are used when firefighters enter the Rehabilitation Sector?**

As a minimum, the protocols for firefighters entering the Rehab Sector should address crew rotation, medical evaluation and treatment, food and fluid replacement, relief from extreme climatic conditions, and documentation requirements.

Crew rotations should begin after personnel have consumed two air bottles, or after they have been working for 45 minutes. Environmental conditions may alter this rule in extremely hot (heat index above 90°F) or cold (wind chill below 10°F) environments as it may be necessary to send firefighters to rehab sooner. It is necessary to incorporate a 45-minute working time to determine when to establish a rehab area as not all incidents require the use of an air pack, but the need for rehab is just as important. To assist accountability at the emergency incident, crews will maintain company integrity when reporting to or exiting from rehab. James Cline (1997)

recommends that entry and exit be carefully controlled to help maintain personnel accountability.

According to research conducted by Martin Kemp (1996), many fire departments recognize a need for emergency incident rehabilitation, but few departments medically monitor their personnel. The departments contacted in a telephone interview confirmed this finding. All of the departments contacted implement some form of rehab at emergency incidents, but only three departments medically monitor their personnel.

Medical evaluation and treatment is an important component of the Rehab Sector. Personnel from the LFD assigned to the Rehabilitation Sector will medically monitor personnel entering the Rehabilitation Sector. These personnel are ECA certified and can perform BLS services. Pulse rates and blood pressures should be taken as firefighters enter the Rehabilitation Sector and then recorded on the LFD Emergency Incident Rehabilitation Form (Appendix B). Training Chief Debbie Morris, from Lubbock County EMS suggested guidelines for LFD personnel to follow when determining whether EMS with ALS personnel should be dispatched to further evaluate firefighters in the Rehabilitation Sector:

- Firefighters diastolic blood pressure is greater than 110 mm Hg
- Firefighters systolic blood pressure is greater than 180 mm Hg
- After 15 minutes in rehab the firefighters pulse rate is above 140 beats per minute
- The firefighter is symptomatic

If these conditions are present, the Incident Commander (IC) should request that EMS report to the incident. EMS protocols for treatment and transport of firefighters will be followed.

Firefighters will be allowed to rest a minimum of 15 minutes in the rehabilitation Sector. At the end of the rest period, the firefighter's pulse rate shall be taken and if it is less than 110 beats per minute, the firefighter shall be released to the IC for reassignment.

Fluid replacement will be mandatory for personnel in rehab. Personnel will be required to drink at least 8 ounces of fluid. Water and sports drinks will be provided to all personnel. Coffee and carbonated drinks will not be provided at the incident including the rehab area. The American Red Cross will provide food on incidents that exceed three hours in length, and the food will consist of soup, broth or stews.

Relief from extreme climatic conditions will be provided when the heat index is above 90°F or wind chill is below 10°F. To determine the shelter area, the Rehab Officer will use the following guidelines:

- An open area in which the rehab area can be created by using tarps, fans, etc
- Fire apparatus, ambulance, or other emergency vehicle at the scene or called to the scene
- Nearby garage, building lobby, or other structure
- Several floors below a fire in a high rise building
- A school bus or municipal bus
- Rehabilitation area shall be readily accessible to EMS and Red Cross

When an emergency incident rehabilitation area is implemented, the Emergency Incident Rehabilitation Report (Appendix B) shall be used to log personnel into and out of the rehab area. The name, company number, and time shall be logged in. Pulse rate, blood pressure, and any complaints or symptoms exhibited will be recorded. As personnel are released from rehab for reassignment the time and their pulse rate, will be recorded. Once the incident is brought to a conclusion, the Emergency Incident Rehabilitation Report will be attached to and filed with the Incident Report.

**What resources are needed to establish a Rehabilitation Sector?**

Resources to set up a Rehab Sector can be provided by the LFD for the initial rehab operation. On extended incidents, outside resources, such as EMS and the American Red Cross will be utilized.

LFD personnel are Emergency Care Attendant (ECA) certified and can provide medical monitoring for personnel at the BLS level. The LFD must rely on EMS to provide ALS personnel for treatment and transport of firefighters. EMS will respond to the scene and perform medical monitoring and treatment on all second or greater alarms, but they will respond to any incident if requested by the IC.

Equipment to set up a rehab area, such as fans, lights, extension cords, and barrier tape, can be obtained from LFD apparatus on the scene. LFD will provide fluid replacement for its personnel during the initial phase of rehab. This is necessary as it will take Red Cross approximately one hour to arrive on the scene from the time of notification. American Red Cross has three vehicles available for fire department assistance. One vehicle, with four to six volunteers, will report to the incident to assist in the rehab area when requested by the IC. These vehicles are stocked with water,

sports drinks, and snacks. Red Cross can obtain dehydrated soups from the South Plains Food Bank and can incorporate them into their supply for fire department use. Red Cross has the capability to set up portable shade for the rehab area when needed, but this must be requested when dispatched so it can be loaded on the vehicle and brought to the incident.

**What procedures have adjacent departments implemented for Emergency Incident Rehabilitation Programs?**

All departments contacted had some form of emergency incident rehabilitation. Four of these departments had Emergency Incident Rehabilitation SOP's in place. These SOP's closely followed FEMA/USFA guidelines in setting up a rehab area and performing medical monitoring and treatment, food and fluid replacement, relief from climatic conditions and crew rotations.

Four of the eleven departments medically monitor personnel as part of their rehab program. Several of the departments contacted in a telephone interview respond EMS to incidents, but EMS personnel are on the scene to standby in case of injury at the emergency and do not perform medical monitoring of personnel.

All departments contacted utilized outside resources when a rehab area was setup. These agencies consist of Red Cross, Salvation Army, or the Ladies Auxiliary to help with food and fluid replacement. Those departments that do no provide EMS service had EMS respond and perform standby duties on second or greater alarms.

As a result of this applied research project, an Emergency Incident Rehabilitation Program for the LFD (Appendix A) and an LFD Emergency Incident Rehabilitation Report (Appendix B) was developed.

## DISCUSSION

The literature was unanimous in its recommendations that an Emergency Incident Rehabilitation Program be implemented at incidents where firefighters are subjected to prolonged stress, vigorous work, or extreme environmental conditions. When justifying the importance of implementing a rehab area, FEMA/USFA *Emergency Incident Rehabilitation guidelines* (1992) states:

> Recent studies have concluded that a properly implemented fireground rehabilitation program will result in fewer accidents and injuries to firefighters. Moreover, responders who are given prompt and adequate time to rest and rehydrate may safely reenter the operational scene, which may reduce the requirement for additional staffing at an incident (n.p.).

This thought is confirmed in more recent literature by Hal Burnett (1998) in that:

> The purpose of a Rehab programme is to ensure that the physical and mental conditions of emergency workers do not deteriorate to a level that will affect the safety of that worker or the safety and integrity of the operation (p. 28).

Robert Laford (1996) relates that NFPA statistics show that strains and sprains are the most common form of injury and that these injuries can be directly related to firefighter fatigue. Laford further states, “A pro-active on-scene safety program, including a rehabilitation area, will help cut down on injuries by reducing fatigue” (p. 15). Washburn, LaBlanc & Fahy (1998) say the leading cause of fatal injury to firefighters in 1997 was stress resulting in heart attack and that, “Health and safety issues should be our first priorities in the battle to reduce on-duty firefighter deaths” (p. 58).

In an applied research project completed by Martin Kemp (1996), one of the conclusions he reached was that few fire departments have Emergency Incident Rehabilitation Programs in place, or the resources available at the emergency scene to ensure that firefighters have an opportunity to rest and recover. This author has reached the same conclusion. Of the area fire departments contacted, relatively few have Emergency Incident Rehabilitation Programs in place. All of the departments contacted had set up some form of rehab at incidents, but like the LFD these rehab areas do not utilize all the components of an effective rehab program as recommended by the literature.

As a result of this study, this author has come to the conclusion that the LFD's past efforts to rehab firefighters was deficient in all of the areas recommended by the literature, such as crew rotation, medical evaluation and treatment, food and fluid replacement, and relief from extreme climatic conditions. The LFD has sent firefighters to a rehab area to rest, but historically it has been after the incident was brought under control. This has resulted in firefighters working several hours before being allowed to rest. The study showed that firefighters should be rotated through rehab every two air bottles or 45 minutes of working time (FEMA/USFA, 1992).

Currently no medical monitoring is conducted at emergency incidents by the LFD. Research has indicated that medical monitoring provides the best indicator of stress levels and recovery. Recommendations by the literature include checking pulse rates, blood pressure, and respiration rates with the pulse rate being the best indicator of recovery (Eckert, 1996).

Food and fluid replacement has consisted of water, sports drinks, coffee, soft drinks, hamburgers, hot dogs, and candy bars. This study has shown, and the literature supports, that some of this is not very healthy in the rehab area. Coffee and soft drinks contain caffeine that can cause palpitations of an already stressed heart. In addition, coffee acts as a diuretic, further dehydrating the body when rehydration is critical. Research also revealed that soups, broth's or stews were better for firefighters as they are digested faster than sandwiches or fast foods (Sachs, 1994).

A greater effort needs to be made in shielding firefighters from extreme climatic conditions. In hot weather it is important that firefighters be able to get out of their protective gear so they can cool down. The insulating effect of this protective gear can lead to heat stress even during cold weather. In cold weather it is just as important that firefighters are sheltered in an area that allows them to take this gear off to cool down.

The result of this study has led to a greater awareness by the author of the importance of establishing an emergency incident rehabilitation area at emergency incidents. The research has also shown the necessity of having SOP's in place that deal with emergency incident rehabilitation. In the telephone interviews conducted, all departments have implemented emergency incident rehabilitation at incidents. However, only four departments had SOP's, and the other seven departments left it up to the Incident Commander on when to implement a rehab area. It was the author's impression that these seven departments operate in the same fashion as the LFD when it sets up rehab in that it just addresses fluid replacement. Although this an important component of a rehabilitation program, it is just one part of an overall program. As a

result of this research, the author has come to the conclusion that what the LFD calls rehab is not an Emergency Incident Rehabilitation Program.

The development of an Emergency Incident Rehabilitation Program would reap several benefits for the LFD. These include personnel knowing the conditions when rehab needs to be implemented and their specific responsibilities if assigned a function in the Rehab Sector. It will allow outside agencies such as EMS and Red Cross to know the LFD needs and how best they can assist the LFD at the incident. In addition, fire department personnel will know what assistance EMS and Red Cross can provide. The most important aspect of an Emergency Incident Rehabilitation Program would be to take care of our most valuable resource on the emergency scene, our personnel. It would have a potential impact of reducing the number of fireground injuries to our personnel. It would allow the fire department to spot potential medical problems early and start treatment before the development of more serious medical problems becomes evident It would also allow for a continuous rotation of fresh personnel to assign at the emergency scene.

## RECOMMENDATIONS

The LFD should incorporate the Emergency Incident Rehabilitation Program (Appendix A) into its procedure manual. In addition, it is recommended that when a rehab area is implemented at an incident, the Emergency Incident Rehabilitation Report (Appendix B) be used to document crew rotation and medical monitoring.

Training of all personnel should be conducted to explain the purpose of an Emergency Incident Rehabilitation Program. Theodore Jarboe (1994) says, “Getting firefighters to adhere to this crew rotation and rehab policy can be quite a challenge for

the IC and the rehab officer . . .” (p. 40). This challenge can be attributed to firefighters reluctance to admit they are in need of rest until the incident is brought under control. Training would educate the firefighter on the health and safety aspects of rehab and help firefighters understand the importance of the program, which would increase compliance with the program.

It is recommended that fire departments that do not have a formal Emergency Incident Rehabilitation Program in place should develop and implement a program. This program can have a significant and positive impact on the health and safety of its members.

Additional research is needed to fully document the benefits of an Emergency Incident Rehabilitation Program. Several authors in the literature stated that as firefighters become fatigued they are at increased risk of injury, and that rehab programs have the potential for reducing these injuries. Research in comparison of injury rates at incidents with rehab programs and those without rehab programs would be beneficial in documenting these benefits.

## REFERENCES

Amarillo Fire Department Standard Operating Procedures. (1997, March). *Rehabilitation*, 1-6. Amarillo, TX: Amarillo Fire Department.

Bonanno, J. T. (1996, May). Post fire recovery. *Health & Safety, 7,* 1-5.

Brooks, W., Parsons–Nicota, J., & Richardson, G. (1998, May). Heart attack. *Firehouse,* 58-62.

Burnett, H. (1998, May). Protecting one's own. *Fire International,* 28.

Clark, D., Smith, D., Petruzzello, S., & Bone, B. (1998, March). Heat stress in the training environment. *Fire Engineering, 151,* 163-168.

Cline, J. (1997, February). Rehab units at work. *Fire Engineering, 150,* 71-72.

Collins, W. M. (1994, January/February). Pre-plan for rehab sectors – they save lives, reduce injuries. *Minnesota Fire Chief, 30,* 7.

*Comprehensive wellness for firefighters*. (1993). Summit, PA: Summitt Fitness Services.

Dallas Fire Department Emergency Procedures. (1995, June). *Rehabilitation ("Rehab" Area),* 1-6. Dallas, TX: Dallas Fire Department.

Denton Fire Department Standard Operating Procedure. (1995, July). *Rehabilitation*, 1-10. Denton, TX: Denton Fire Department.

Dunn, V. (1995, August). Heat injury. *Firehouse, 20,* 24-26.

Eckert, C. (1996, April). Rehabilitation on the fireground. *Health & Safety, 7,* 8-9.

Federal Emergency Management Agency, United States Fire Administration. (1992, July). *Emergency incident rehabilitation* (FA-114). United States Fire Administration Publication Center.

Garland Fire Department Operations Standard Operating Procedure. (1997, June). *Emergency Incident Rehabilitation,* 1-7. Garland, TX: Garland Fire Department.

Heilman, J. (1998, Spring/Summer). Rehab an inside look. *Texas Fire Chief,* 22-25.

International Association of Firefighters. (N.D.). 1996 Death and Injury Survey, [Brochure]. Washington D.C.: Author.

Jarboe, T. L. (1994, April). 10 common fireground mistakes. *Fire Chief, 38,* 38-40.

Kemp, M.T. (1996, November). *Rest and recuperation of firefighters.* Executive Fire Officer Program, Emmitsburg, MD: National Fire Academy.

Laford, R. F. (1996, December). Safety officer's corner: replacements and recovery. *Voice, 25,* 15.

Lubbock Fire Department Procedures Manual. (1997, February). *Incident command system,* 1-16. Lubbock, TX: Lubbock Fire Department.

Muhler, D., Froelicher, V., Miller, N., & York, T. (1995). *ACSM'S guidelines for exercise testing and prescription* (5th ed.). Media, PA: American College of Sports Medicine.

National Fire Protection Association. (Version 3.11.3) [CD-ROM]. *NFPA 1500: Standard on fire department occupational safety and health* (1997 ed.). Quincy, MA: Author.

National Fire Protection Association. (Version 3.11.3) [CD-ROM]. *NFPA 1561: Standard on fire department incident management system* (1995 ed.). Quincy, MA: Author.

O'Connor, J. (1996, February/March). How to beat the heat. *Firefighter's News, 14,* 20-21.

Peterson, J. (1998, May/June). 10 ways to avoid a heat-related condition while exercising. *ACSM's Health & Fitness, 2,* 48.

Sachs, G. M. (1994, July). EMS operations on the fireground. *Fire Engineering, 147,* 26-30.

Sullivan, W. F. (1996, December). Rehab for life. *Fire Engineering, 149,* 51-55.

Ullman, K. V. (1994, May). Rehab. *Firehouse, 19,* 35-36.

Washburn, A., LeBlanc, P., & Fahy, R. (1998 July/August). 1997 firefighter fatalities. *NFPA Journal, 92,* 50-62.

**APPENDIX A**

# Lubbock Fire Department

| | |
|---|---|
| **Operational Procedures** | |
| **Emergency Incident Rehabilitation** | |
| | |
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## I Purpose

To ensure the physical and mental conditions of members operating at the scene of an emergency or training exercise do not deteriorate to a point that they affect the safety of each member, or jeopardize the safety and integrity of the operation.

## II Scope

This procedure shall apply to all emergency operations and training exercises where strenuous physical activity or exposure to heat or cold exists.

## III Responsibilities

A. Incident Commander

1. The Incident Commander shall consider the circumstances of each incident and make adequate provisions early in the incident for the rest and rehabilitation of all members operating at the scene. These provisions shall include medical evaluation, treatment and monitoring, food and fluid replenishment, mental rest, and relief from extreme climatic conditions.

B. Supervisors

1. All supervisors shall maintain an awareness of the condition of each member operating within their span of control and ensure that adequate steps are taken to provide for each member's safety and health. The command structure shall be utilized to request relief and reassignment of fatigued crews.

C. Personnel

1. During periods of hot weather, members shall be encouraged to drink water and activity beverages throughout the workday. During any emergency incident or training evolution, all members shall advise their supervisor when they believe their level of fatigue or exposure to heat or cold is approaching a level that could affect themselves, their crew, or the operation in which they are involved. Members shall also remain aware of the health and safety of other members of their crew.

## IV Definitions

A. Level I Rehabilitation: For situations that are of short duration on first alarms.

1. The Incident Commander may elect to use the rehab supplies located on the rehab vehicle.

2. Fire department personnel can perform medical monitoring.

a) Must have an ECA certification as a minimum.

b) If personnel show signs or symptoms of medical problems, EMS will be requested for further medical evaluation and treatment.

B. Level II Rehabilitation: Implemented on 2nd or greater alarms, hazardous materials incidents involving the Hazardous Materials Team, or for situations requiring a major time and personnel commitment from firefighting forces.

1. The Incident Commander will call for the rehab vehicle to be brought to the scene.

2. EMS will be dispatched to the scene to perform medical monitoring

a) Department personnel will perform medical monitoring until EMS arrives.

3. Red Cross will be requested to report to the rehab area.

## V. Establishment of a Rehabilitation Sector.

A. Responsibility

1. The Incident Commander will establish a Rehabilitation Sector when conditions indicate that rest and rehabilitation is needed for personnel operating at an incident scene or training evolution. A member with a radio will be placed in charge of the sector and shall be known as the Rehab Officer. The Rehab Officer shall report to Command.

a) The Incident Commander will determine if Level I or Level II rehab will be implemented.

B. Location

1. The Incident Commander will normally designate the location for the Rehabilitation Area. If a specific location has not been designated, the Rehab Officer shall select an appropriate location.

C. Site Characteristics

1. It should be in a location that will provide physical rest by allowing the body to recuperate from the demands and hazards of the emergency operation or training evolution.

2. It should be far enough away from the scene that members may safely remove their turnout gear and SCBA and be afforded mental rest from the stress and pressure of the emergency operation or training evolution.

3. It should provide suitable protection from the prevailing environmental conditions. During hot weather, should be in a cool, shaded area. During cold weather, it should be in a warm, dry area.

4. It should enable members to be free of exhaust fumes from apparatus, vehicles, or equipment.

5. It should be large enough to accommodate multiple crews, based on the size of the incident.

6. It should be easily accessible by EMS units and the Red Cross.

7. It should allow prompt reentry back into the emergency operation upon complete recuperation.

8. It should be located in an area that is away from any spectators or bystanders at the scene.

9. The Rehab Sector boundaries will be defined with yellow fire line tape and will have only one entry and exit point.

D. Site Designations

1. A nearby garage, building lobby, or other structure.

2. In high rise incidents, one floor below the Operations Sector.

3. Fire apparatus, ambulance, or other emergency vehicles at the scene.

4. An open area in which a rehab area can be created.

E. Resources

1. The Lubbock Fire Department rehab vehicle is available for response when requested by the Incident Commander. When the rehab vehicle is requested one (preferably two) personnel shall man it. The highest-ranking member on the rehab vehicle will be designated the Rehab Officer.

   a) The rehab vehicle will be stocked with ice, fluids, medical equipment, chairs, tarps and other equipment to set up a rehab area.

2. If a Level I rehab sector is established, EMS may be requested to perform medical monitoring.

   a) If EMS is not requested, Rehab Sector personnel are required to perform medical monitoring

3. If a Level II rehab sector is established, the Incident Commander shall request that EMS be dispatched to perform medical monitoring.

   a) At second or greater alarms one of the recalled District Chiefs will assume the duties of the Rehab Officer.

4. If an incident is expected to exceed two hours in length, Red Cross can be requested to assist in the Rehab Sector.

   a) Red Cross needs to be notified as soon as possible as it will take them approximately one hour to report to the scene.

## VI. Guidelines

A. Rehabilitation Sector Establishment.

1. During the initial planning stages of an emergency response Command should consider rehabilitation. However, the climatic or environmental conditions of the emergency scene should not be the sole justification for establishing a Rehabilitation Area. Any activity/incident that is large in size, long in duration and/or labor intensive will rapidly deplete the energy and strength of personnel and therefore merits consideration for rehabilitation.

   a) The “two air bottle rule,” or 45 minutes of work time is recommended as an acceptable level prior to mandatory rehabilitation.

      1) Firefighters who have worked for two full 30-minute rated bottles shall be placed in the Rehabilitation Sector for rest and evaluation.

2. Climatic or environmental conditions that indicate the need to establish a Rehabilitation Sector are a heat stress index above 90°F or a wind-chill index below 10°F.

a) The IC can have dispatch contact the weather service for these current conditions.

B. Hydration

1. A critical factor in prevention of heat injury is the maintenance of fluid levels in the body. Water must be replaced during exercise periods and at emergency incidents. During heat stress, the member should consume at least one quart of water per hour. This fluid should be served at a temperature between 40° F and 50° F.

a) Rehydration is important even during cold weather operations where despite the outside temperature heat stress may occur during firefighting, or other strenuous activity when protective equipment is worn.

2. Beverages that contain caffeine should be avoided as they interfere with the body's water conservation mechanisms.

a) Carbonated beverages should be avoided.

C. Nourishment

1. At incidents expected to exceed two hours in length the Incident Commander can request that Red Cross report to the incident.

2. Red Cross has fluids, soups, broths and snacks available to bring to the scene.

a) These can be digested much faster than sandwiches and fast food products.

b) Fatty and/or salty foods should be avoided.

D. Rest

1. Personnel sent to rehab shall be allowed to rest at least fifteen minutes.

2. In all cases the objective evaluation of a member's medical condition shall be the criteria for rehab time.

3. Personnel shall not be released from rehab unless their heart rate is below 110 beats per minute.

E. Recovery

1. Members in the Rehabilitation Area should maintain a high level of hydration.

2. Member should not be moved from a hot environment directly into an air-conditioned area as the body's cooling system could shut down in response to the external cooling.

a) An air-conditioned environment is acceptable after a cool down period at ambient temperature with sufficient air movement.

F. Medical Evaluation

1. As personnel enter the rehab area the heart rate and blood pressure should be taken. The heart rate should be measured for 30 seconds as early as possible in the rest period.

2. If personnel exhibit signs or symptoms that could indicate potential medical problems EMS will be dispatched to the incident for further evaluation. If firefighters exhibit any of the following symptoms EMS will be requested.

a) Diastolic blood pressure is greater than 110 mm Hg.

b) Systolic blood pressure is greater than 180 mm Hg.

c) If after 15 minutes in rehab the pulse rate is above 140 beats per minute.

d) If the firefighter is symptomatic.

1. Pulse rates will be taken from firefighters before they are released from rehab.

a) Only those firefighters with pulse rates below 110 beats per minute will be released.

G. Documentation

1. If Level I or Level II rehab is implemented all medical evaluations conducted shall be recorded on the Lubbock Fire Department Emergency Incident Rehabilitation Form.

a) This form will be attached to and filed with the incident report.

H. Accountability

1. Members assigned to the Rehabilitation Sector shall enter and exit the sector as a crew. The Rehab Officer shall document the names, crew designations, and the times of entry to and exit from the rehab area.

2. Crews shall not leave the Rehabilitation Sector until authorized to do so by the Rehab Officer.

**APPENDIX B**

# LUBBOCK FIRE DEPARTMENT EMERGENCY INCIDENT REHABILITATION REPORT

| Date | Incident # | Location | Rehab Officer |
|---|---|---|---|
| | | | |

| Name/Company | Time In | Pulse Rate | B/P | Time out | Pulse Rate | Comments |
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